



First records of the termite, *Termes hispaniolae* (Banks, 1918) (Isoptera, Termitidae, Termitinae), from Bolivia and new Caribbean Basin records

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Abstract

The genus *Termes* Linnaeus, 1758 occurs in the Neotropical, Ethiopian, and Oriental regions and is notable for the long, narrow, and nearly symmetrical mandibles of the soldier caste. I report the presence of *T. hispaniolae* (Banks, 1918) in Bolivia and provide many additional new geographic records throughout the Caribbean Basin. *Termes hispaniolae* is common in much of its range, and workers are characterized by a diagnostic enteric valve armature that is described here for the first time.

Keywords

Distribution, enteric valve armature, soldier, worker.

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Introduction

The subfamily Termitinae is a polyphyletic group (Inward et al. 2007) of primarily tropicopolitan soil and wood feeding termites (Krishna et al. 2013a). *Termes* Linnaeus, 1758 now consists of 23 species and is a common genus of the Neotropical, Ethiopian, and Oriental regions. From these, eight species are described from the Neotropics. However, only three species, *T. hispaniolae* (Banks, 1918), *T. melindae* Harris, 1960, and *T. panamaensis* (Snyder, 1923) occur outside of South America. The soldiers of *Termes* have snapping mandibles (Snyder 1924), producing one of the fastest animal movements known (Seid et al. 2008).

Over the last decade, the enteric valve armature (EVA) of the worker caste, especially in soil-feeding species, has become a diagnostic, robust, and character-rich structure (Bourguignon et al. 2016). In fact, the

description of soldierless termites is often dependent on the morphology of the EVA (Scheffrahn et al. 2017). In wood/grass-feeding termitids, the EVA is not as diagnostic at the species level but is sometimes characteristic at the genus rank (Sands 1998). In the case of *T. hispaniolae*, however, the EVA is diagnostic when compared to its Neotropical congeners.

Herein, I report the first records of *T. hispaniolae* from Bolivia and numerous novel circum-Caribbean localities. I also describe the worker EVA for the first time. Finally, I support the conclusion of Emerson (unpublished, see Krishna et al. 2013: 2371) that *T. melindae* is a junior synonym of *T. hispaniolae*.

Methods

Termites were aspirated from black carton material (usually incased in wood) and preserved in 85% ethanol. All

samples are housed in the University of Florida Termite Collection (UFTC), Davie, Florida. Soldiers of *T. hispaniolae* and *T. panamaensis*, both from Panama (UFTC no. PN443 and PN774, respectively), were photographed as multi-layer montages using a Leica M205C stereomicroscope controlled by Leica Application Suite version 3 software (Figs 1A–C, 2A–C). The worker EVAs of both species were dissected and slide-mounted (Figs 1D, 2D) following the procedure of Scheffrahn et al. (2017). The *T. hispaniolae* locality map was prepared using ArcMap v. 10.3 (Fig. 3). The head widths of 10 *T. hispaniolae* soldiers from Bolivia were measured using an ocular micrometer fitted to a stereomicroscope.

Results

Termes hispaniolae (Banks, 1918)

New records. BOLIVIA • 1 soldier, 15 workers; Depto. Cochabamba, Villa Tunari; -16.9704 , -65.2100 ; 231 m a.s.l.; 26 May 2013; R. Constantino; UFTC no. BO90 • 16 workers; Depto. Cochabamba, Iviganzama loc. 1;

-17.0555 , -64.7598 ; 216 m a.s.l.; 27 May 2013; T. Carrizo; BO228 • 3 soldiers, many workers; Cochabamba, Iviganzama loc. 2; -17.0555 , -64.7598 ; 232 m a.s.l.; 27 May 2013; J. Chase; BO289 • 6 soldiers, many workers; Depto. Beni, N. Trinidad; -14.7021 , -64.8910 ; 155 m a.s.l.; 29 May 20013; R. Scheffrahn; BO424.

Table 1 provides collection localities of *T. hispaniolae* from the literature. All UFTC records are made available by Scheffrahn (2019).

Identification. All descriptions of the *T. hispaniolae* soldiers are consistent and include the line drawings by Emerson (1925: fig. 85d), Mathews (1977: figs 78, 78a), and Constantino (2002: fig. 25). Scheffrahn et al. (2006: fig. 3E) provided a photograph of *T. hispaniolae* from the Bahamas. The soldier of *T. hispaniolae* is easily distinguished from its Neotropical congeners by its short frontal process which forms nearly a right angle in lateral view and lacks a dorsal curve or pointed apex (Fig. 1C, arrow). The frontal process does not extend beyond the antennal carinae. As a comparison, its sympatric congener, *T. panamaensis* (Fig. 2A–C), and all other described

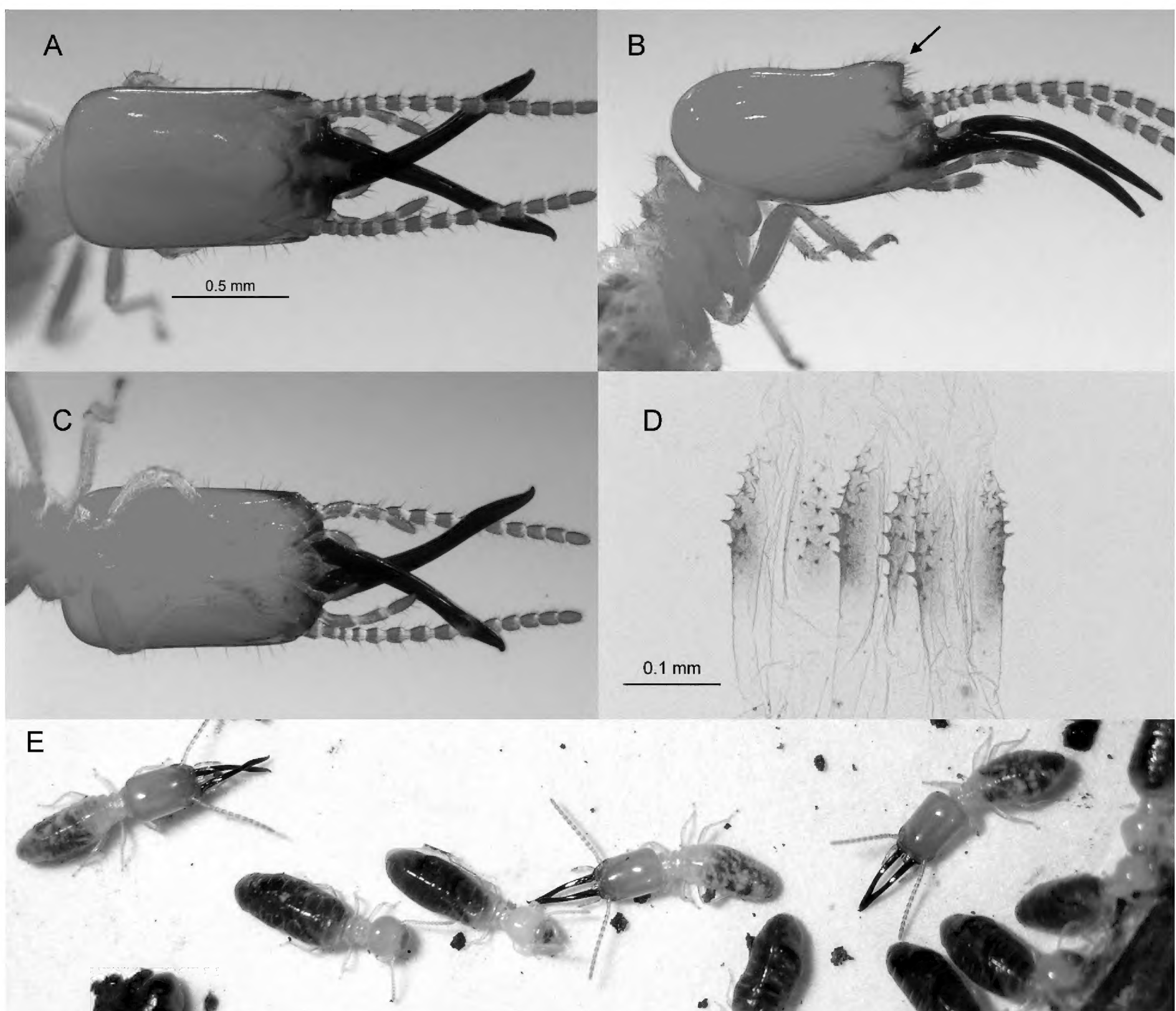


Figure 1. *Termes hispaniolae*. **A–C.** Head capsule of soldier: **(A)** dorsal; **(B)** lateral (arrow = frontal process); **(C)** ventral. **D.** Enteric valve armature of worker. **E.** Live habitus of soldiers and workers from Honduras. Photo taken in Petri dish.

Neotropical *Termes* have one or more of the following characters of the frontal process lacking in *T. hispaniolae*: acute angle, curved dorsal margin, pointed apex,

projection beyond the antennal carinae.
The *T. hispaniolae* soldier is among the two largest of the Neotropical species with maximum head widths

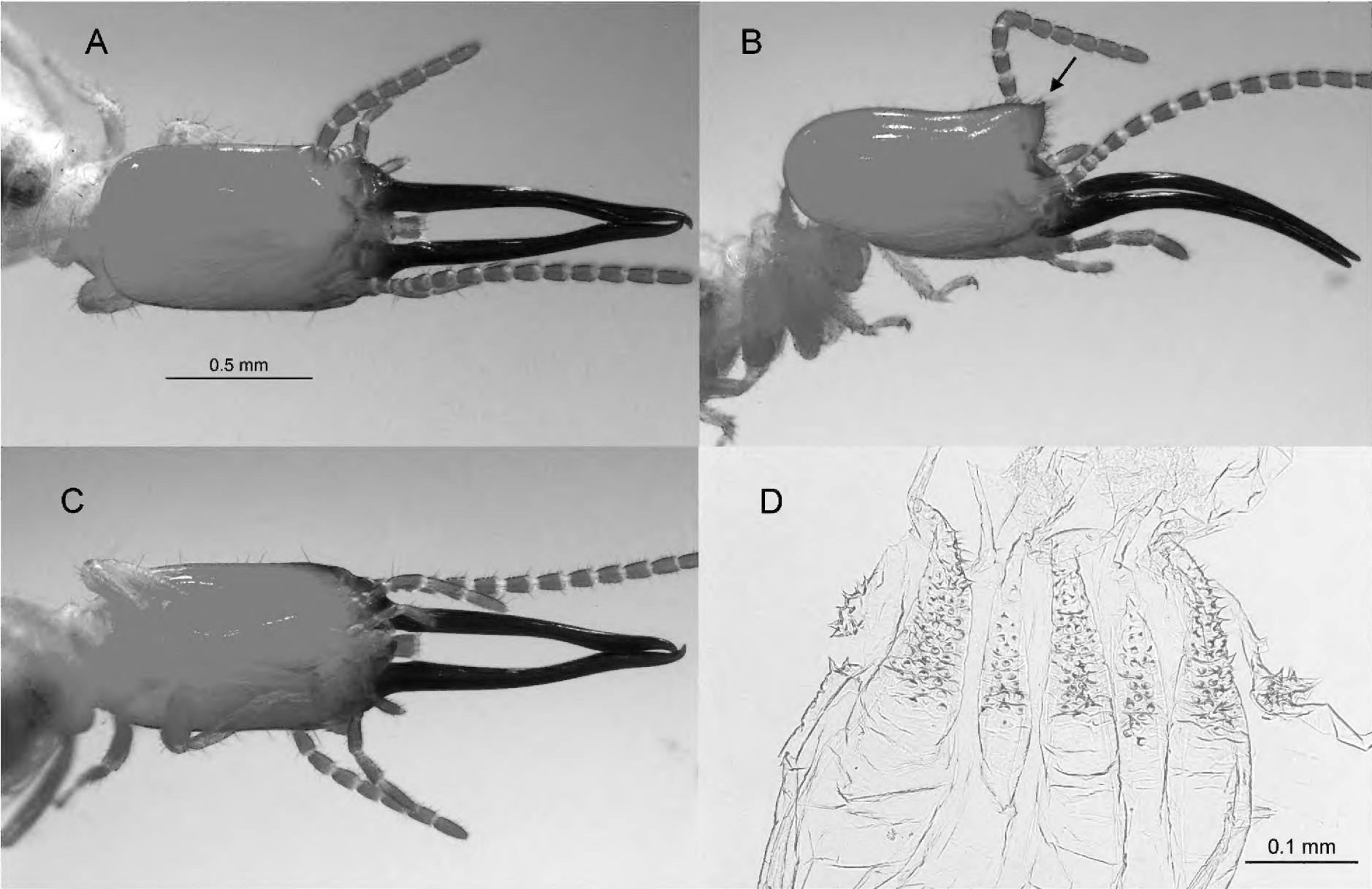


Figure 2. *Termes panamaensis*. **A–C.** Head capsule of soldier: **(A)** dorsal; **(B)** lateral (arrow = frontal process); **(C)** ventral. **D.** Enteric valve armature of worker.

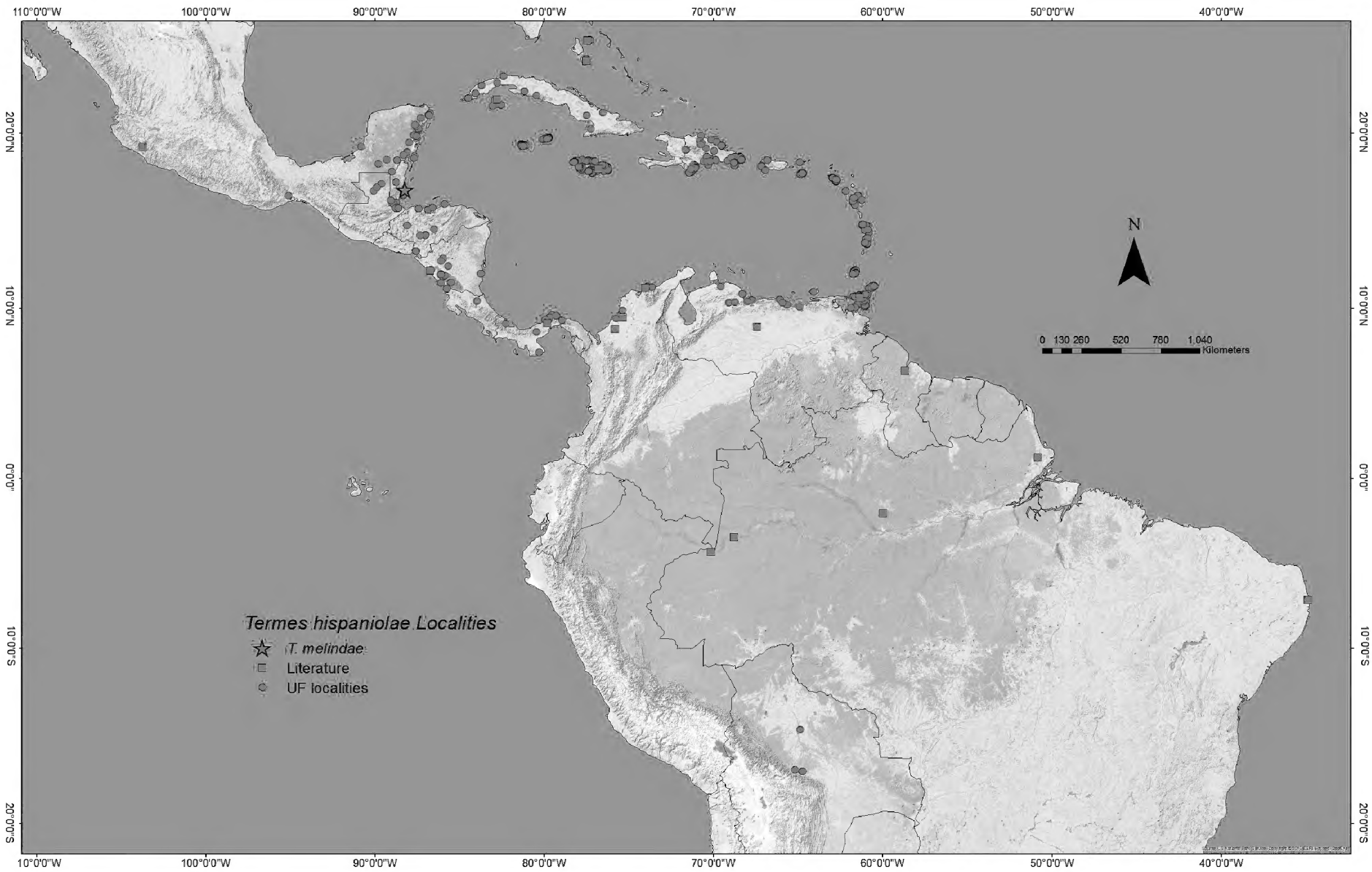


Figure 3. Locality map of *Termes hispaniolae* from the literature (yellow squares, Table 1) and University of Florida Termite Collection (red circles). Yellow star: type locality designated by Harris (1960) for *T. melindae* (junior synonym of *T. hispaniolae*).

Table 1. Literature localities for *Termes hispaniolae*.

Country	Locality	Latitude	Longitude	Reference
Bahamas	South Andros	23.97	-77.53	Scheffrahn et al. 2006
Bahamas	New Providence	25.06	-77.45	Scheffrahn et al. 2006
Belize	Stan Creek Valley	16.84	-88.27	Harris 1960
Brazil	Aporema	1.24	-50.82	Constantino and Canello 1992
Brazil	Presidente Figueiredo	-2.06	-60.00	de Sales Dambros et al. 2012
Brazil	Benjamin Constant	-41.35	-70.03	Acioli and Oliveira 2013
Brazil	São Paulo de Olivença	-3.45	-68.80	Acioli and Oliveira 2013
Brazil	Atalaia do Norte	-4.33	-70.15	Acioli and Oliveira 2013
Brazil	Mata do Buraquinho	-7.14	-34.86	Ernesto et al. 2014
Colombia	Parque Tayrona	11.22	-74.04	Casalla and Korb 2019
Colombia	El Ceibal	8.80	-75.82	Casalla and Korb 2019
Colombia	Colosó Sucre	9.49	-75.35	Casalla and Korb 2019
Cuba	Pinar del Rio	22.34	-83.66	Banks 1919
Cuba	Isla de Pinos	21.87	-82.81	Barreto 1923
Guayana	Kartabo	6.38	-58.70	Emerson 1925
Haiti	Diquini	18.53	-72.39	Banks 1919
Jamaica	Kingston	18.03	-76.81	Snyder 1956
Mexico	Colima	19.25	-103.73	Light 1933
Nicaragua	Puerto Sardino	12.20	-86.76	Scheffrahn et al. 2005
Panama	Barro Colorado Is.	9.16	-79.85	Snyder 1925
Trinidad and Tobago	Trinidad	10.63	-61.35	Adamson 1937
Venezuela	Calabozo	8.92	-67.42	Issa 2000

of 1.09–1.16 mm (Emerson 1926), 1.08 (Mathews 1977), 1.08 (Constantino 2002), and 1.08 (Scheffrahn et al. 2006). Silvestri (1903) reported the maximum head width of *Termes riograndensis* Jhering 1887 at 1.1 mm. The maximum head width range of the 10 *T. hispaniolae* soldiers from Bolivia reported herein was 1.01–1.11 mm (mean 1.05 mm). The soldier head widths of all remaining Neotropical *Termes* range from 0.75 mm (*T. ayri* Bandeira and Canello, 1992) to 1.00 mm (*Termes medioculatus* Emerson, 1949).

The only depictions of *Termes* worker EVAs were photographs by Miller (1990: fig. 21, of *T. fatalis* Linnaeus, 1758, type), Hellemans et al. 2017: fig. 7B, also of *T. fatalis*), and Sands (1998: pl. 16, fig. 4, of *Termes hospes* Sjöstedt, 1900) which are very similar to the weakly sclerotized EVA of *T. panamaensis* (Fig. 2D). The EVA of *T. hispaniolae* workers (Fig. 1D) consists of six elongate cushions adorned with conical spines directed toward the EVA lumen. The size and position of spines vary somewhat among cushions but each cushion has about 4–7 longer spines and about as many shorter spines. The cushion surface encompassed by spines is more sclerotized than the surrounding cuticle. All Neotropical *Termes* worker EVAs are similar to that of *T. panamaensis* in having three larger cushions alternating between three smaller cushions (Fig. 2D). The cushions are covered with 15–30 unsclerotized cones with fine setae-like tips.

Harris (1960) described *T. melindae* from a single colony that he collected in Belize (Melinda Forest Station, fig. 4). His drawings and measurements (maximum head width 1.02–1.04 mm) of the *T. melindae* soldier fit well within the intraspecific variability of this species (Emerson 1926; Mathews 1977; Constantino 1991; Scheffrahn

et al. 2006). Material in the UF collection from the *T. melindae* type locality also match *T. hispaniolae* based on the soldier and the worker EVA morphology, thus relegating *T. melindae* to junior synonym status of *T. hispaniolae* as proposed by Emerson (Krishna et al. 2013b).

Discussion

I report, for the first time, the occurrence of *T. hispaniolae* in central Bolivia which extends the known range of this termite by about 1,500 km to the south (Fig. 3). *Termes* is a common genus in the Neotropics. Of the 4,548 UFTC colony samples of termitines from South America, Central America, and the Antilles, 1,345 are *Termes* spp. Surmised to have been a recent introduction to the central Bahamas (New Providence, S. Andros and Paradise) by Evans 2010, it is almost certain that *T. hispaniolae* established naturally, probably from overwater dispersal in infested flotsam from nearby Cuba (Scheffrahn et al. 2006). This dispersal mechanism is facilitated by its aerial nesting and feeding habit. Colonies of *T. hispaniolae* are typically found in black carton-filled voids of live and dead tree branches on which they feed. Other species, such as *T. panamaensis*, are soil dwelling and feed within the wood–soil interface (Roisin et al. 2006).

Mathews (1977) described the genus *Inquilinitermes* and separated it from *Termes* because of its apparent obligate residence in *Constrictotermes* Holmgren, 1910 nests and because of minor morphological differences. Mathews (1977) reported that the EVA of *Inquilinitermes* and *Termes* are “of the same type” but did not provide figures. This was corroborated by Scheffrahn (2014) who provided a photograph (his fig. 5) of

the EVA of *I. johnchapmani* Scheffrahn which does not reside with *Constrictotermes*. Recent molecular support for the transfer of *Inquilinitermes* species to *Termes* was given by Hellemans et al. (2017). Their phylogenetic tree shows that *Termes* is nested within *Inquilinitermes*; however Hellemans et al. (2017) did not give a recommendation on synonymizing these genera under *Termes*.

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